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LOW-TACK GUM BASE AND CHEWING GUM

[Teinenchakusei no gamubeisu oyobi chuingamu]

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Title: **LOW-TACK GUM BASE AND CHEWING GUM**

[57] **Abstract**

Goal: To offer a low-tack gum base and chewing gum without adversely affecting flavor and mouthfeel.

Structure: A synthetic ethylene-propylene copolymer is used as a gum base raw material.

Effects: The inventive gum base and chewing gum of the present invention have low tack, with flavor and mouthfeel virtually identical to those of conventional products.

Claims

1. Gum base characterized by the fact that an ethylene-propylene copolymer that functions as a gum base raw material is added in a proportion of 5-50 wt%.

2. Gum base according to Claim 1, characterized by the fact that it partially or completely lacks the petroleum-base wax used as a gum base ingredient.

3. Gum base according to Claim 1 or 2, characterized by the fact that it partially or completely lacks the vinyl acetate resin used as a gum base ingredient.

4. Gum base according to Claim 1, characterized by the fact that the average molecular weight of the ethylene-propylene copolymer is in the range of 400-10,000 and the average side chain number (number of side chains per one molecule of a straight chain polymer) is in the range of 0.5-20.0.

5. Chewing gum characterized by the fact that it contains a gum base containing as an ingredient an ethylene-propylene copolymer compounded in a proportion of 5-50 wt% is used.

6. Chewing gum according to Claim 5, characterized by the fact that it partially or completely lacks the petroleum-base wax used as a gum base ingredient.

7. Chewing gum according to Claim 5 or 6, characterized by the fact that it partially or completely lacks the vinyl acetate resin used as a gum base ingredient.

8. Chewing gum according to Claim 5, characterized by the fact that the average molecular weight of the ethylene-propylene copolymer is in the range of 400-10,000 and the average side chain number is in the range of 0.5-20.0.

Detailed Description of the Invention

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Field of Industrial Application

The present invention concerns a low-tack gum base and a chewing gum for reducing the adhesiveness of the gum to teeth, false teeth and dental fillings during chewing and to floors, roads and the like.

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Prior Art

Conventional chewing gums have a unique tack, which can cause an unpleasant sensation to the user because of the chewing gum adhering onto the teeth, false teeth or dental filling materials, and brings about the social problems of spent chewing gum wads adhering to floors, roads and the like.

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Various means of reducing the tack of chewing gum have been attempted in the past to solve the above-mentioned problems of chewing gum. Conventional means of reducing the tack of chewing gum include selectively eliminating the gum base material with a high tack as disclosed in US Patent No. 3,984,574 and a method of introducing a new raw material by adding a slip agent into the gum base composition as disclosed in US Patent No. 2,241,091. However, most of these methods are inadequate in that the effect cannot be retained for a long period of time or the original excellent characteristics (particularly mouthfeel) are lost as a tradeoff to reducing the tack.

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For example, when an ethylene polymer, which is acceptable in countries like the United States of America, is used in the gum base, the tack is reduced relatively, but the resulting material loses elasticity; the paraffin wax used as a gum base ingredient is replaced and the

mouthfeel deteriorates substantially. Additionally, eliminating the resin raw material and replacing it with another raw material affect the flavor adversely, even if the effect of reducing tack can be achieved.

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Another specific example of reducing the tack of chewing gums was disclosed in US Patent No. 3,255,018, involving the addition of a gelatin tannic acid adhesive to the chewing gum. However, tannic acid is water soluble and thus elutes away during chewing; as a result, a continuous anti-adhesion effect cannot be achieved.

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Likewise, the use of ethyl cellulose was disclosed in US Patent No. 2,273,425; the use of a fluorine-containing polyolefin resin was disclosed in USA Patent No. 3,285,750, and the use of a terphenyl mixture as a non-sticking agent was disclosed in US Patent No. 2,383,145. However, these means adversele affect the mouthfeel and flavor of the chewing gum.

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Further, here in Japan, a non-sticking gum base formed by compounding an elastomer, an inorganic aid, a hydrofined oil, poly(vinyl acetate) and a fatty acid monoglyceride or diglyceride was disclosed in Japanese Kokai Laid-open Patent (Tokko) Application 1983-53898. This technique provides excellent effects in preventing the chewing gum from adhering to false teeth, but leads to a chewing gum that lacks softness, thereby causing poor mouthfeel (ie, the base feel is strong). Furthermore, hydrogenated oil, a mandatory ingredient, oxidizes readily; as a result, long-term stability is poor, causing deterioration to the flavor of the chewing gum, which is a drawback.

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Further, a non-sticking chewing gum was disclosed in Japanese Kokai (Laid-open Patent) Application 1992-45141, which involves the use of (1) lecithin or a derivative thereof as an emulsifier and (2) a non-sticking rosin, a rosin derivative or a polyhydric alcohol ester thereof (includes hydrogenated wood rosin glycerin esters) as a elastomer resin. However, these ingredients are a gum base resin substance like those gum bases that contain natural elastomer, such as chicle, and thus are intrinsically quite tacky; as a result, chewing gums that contain these ingredients are limited in their ability to prevent adhesion to teeth and the like. Moreover, lecithin and the derivatives thereof possess a typical odor that affects the flavor adversely, which is also a drawback.

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The inventors of the present application have already proposed a technique (Japanese Kokai (Laid-open Patent) Application No. 1991-76901) as a means of solving the above-mentioned shortcomings of the prior art, but the method involves the use of a petroleum-base wax as a gum base ingredient. Although petroleum-base waxes are a highly-purified material and have been established as being safe for use in chewing gum, the fact that these waxes are derived from petroleum leads to resistance from the image standpoint by some consumers.

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Thus, in the atate of the art, a new material that can be widely used as a gum base cannot be found easily.

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Problems to be Solved By the Invention

The inventors of the present invention conducted intensive research aimed at obtaining a non-petroleum-base gum base that can reduce tack without impairing the mouthfeel and flavor of a chewing gum, and, as a result, arrived at the present invention after finding that the use of an ethylene-propylene copolymer, which is a purely chemical synthetic material, can provides excellent results. Specifically, ethylene-propylene copolymers possess various properties obtaining by varying the molecular weight and molecular structure. Some of these copolymers have a hardness similar to the petroleum-base waxes (eg, microcrystalline waxes and paraffin waxes) and the vinyl acetate resins used as gum base ingredients and can be used as a substitute for these materials. The inventors of the present invention discovered that substituting the above-mentioned petroleum-base waxes and vinyl acetate resins with the above-mentioned ethylene-propylene copolymer does not impart tack to the gum base and that chewing gums that involve the use of the above-mentioned ethylene-propylene copolymer are not different from typical chewing gums from the standpoint of flavor and mouthfeel, although their tack can be reduced.

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Means of Solving the Problems

The ethylene-propylene copolymer, developed by Petroright Inc. of the United States of America, obtained by copolymerizing an ethylene monomer and a propylene monomer, and can be procured commercially. Its characteristics include the following merits: (1) consistent product qualities, (2) products with various molecular weights and branching positions, lengths and numbers can be prepared freely (accordingly, chewing gums can be provided with various physical properties, when this ethylene-propylene copolymer is used), and (3) narrow melting point range. This ethylene-propylene copolymer is also very safe to the health. For these reasons, this ethylene-propylene copolymer can be used as a starting material for various products, and a variety of utilization methods are possible.

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Currently, ethylene-propylene copolymers are being used as substitutes for micro-waxes, ink additives, cosmetic products, lamination adhesives, hot melt adhesives, casting wax additives, molding agents, pigment flushings and the like.

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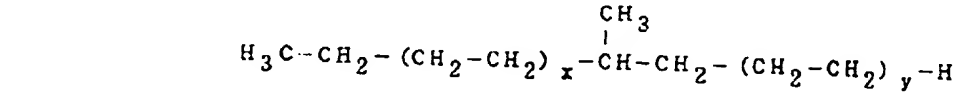
The basic structure of ethylene-propylene copolymers is represented by the following formula.

Chemical Formula 1



However, various materials can be obtained by varying the molecular weight and the number of side chains with respect to the straight chain. Petroleum-base waxes (eg, microcrystalline waxes and paraffin waxes) and vinyl acetate resins, as shown in the following Table 1, are most suitable, from the standpoint of physical properties, as gum base ingredients that can be substituted with the present raw material.

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Table 1

Gum base ingredient	Chewing properties	Requirements for substitutable copolymer
Paraffin wax	Soft; lacks elasticity; flat mouthfeel	Average molecular weight: 400-600 Average side chain number: 0-0.5
Microcrystalline wax	Soft with a certain degree of elasticity; volume feels	Average molecular weight: 600-800 Average side chain number: 1.0-2.0
Vinyl acetate resin (degree of polymerization: 150-250)	Hard; possesses viscoelasticity	Average molecular weight: 2,000-10,000 Average side chain number: 4.0-20.0

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Accordingly, a chewing gum can be manufactured by using two or more kinds of ethylene-propylene copolymers as a gum base raw material for substituting part or all of the petroleum-base wax or vinyl acetate resin.

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According to the present invention, other gum base raw materials that are used in the manufacture of common chewing gums can also be used.

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Ethylene-propylene copolymers that are preferred for use should have an average molecular weight of 400-10,000 and an average side chain number (ie, the number of side chains per molecule of straight chain polymer) of 0.5-20.0.

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This ethylene-propylene copolymer is compounded in a gum base in a proportion of 5-50 wt%. If the ethylene-propylene copolymer is compounded at an amount less than 5 wt%, the low

tack targeted by the present invention cannot be achieved adequately, whereas an amount exceeding 50 wt% leads to poor mouthfeel and flavor, which is undesirable.

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Further, the gum base and chewing gum can be manufactured in accordance with a conventional method.

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Next, the present invention is described specifically by means of practical examples, reference examples and test examples.

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Embodiments

Embodiments 1-6

A gum base of the present invention was manufactured with the gum base raw materials and at the compounding proportions (wt%) shown in the following Table 2 by means of a conventional method (ie, using a kneader and melting/mixing at 120°C).

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Reference Examples 1-2

A conventional gum base was manufactured in the same manner as Embodiments 1-6, except that an ethylene-propylene copolymer was not used, as shown in Table 2. Specifically, Reference Example 1 pertains to a gum base with a typical tack, and Reference Example 2 pertains to a low-tack gum base in which the gum base ingtredients do not include chicle and hydrogenated rosin ester gum.

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Table 2

	Embodiment 1	Embodiment 2	Embodiment 3	Embodiment 4	Reference Example 1	Embodiment 5	Embodiment 6	Reference Example 2
chicle	20	20	20	20	20	—	—	—
vinyl acetate resin	15	25	—	—	25	20	—	35
poly(isobutylene)	10	10	10	10	10	20	20	20
hydrogenated rosin ester gum	10	10	10	10	10	—	—	—
microcrystalline wax	10	—	20	—	20	10	—	25
monoglyceride	2	2	2	2	2	5	5	5
calcium carbonate	13	13	13	13	13	15	15	15
ethylene-propylene copolymer A	10	20	—	20	—	15	25	—
ethylene-propylene copolymer B	10	—	25	25	—	15	35	—
Total	100	100	100	100	100	100	100	100

ethylene-propylene copolymer A: average molecular weight 700 and average side chain number 1.0
ethylene-propylene copolymer B: average molecular weight 2000 and average side chain number 5.0

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Embodiments 7-12

A chewing gum was manufactured using a mixer, at a compounding ratio of 25 parts (parts in weight; same below) inventive gum base manufactured in accordance with the method of Embodiments 1-6, 58 parts table sugar, 6 parts crystalline glucose, 8 parts Bx 85 corn syrup, 2 parts glycerin and 1 part peppermint flavor. Further, the gum bases in accordance with the methods of Embodiments 1-6 correspond to the chewing gums based on the methods of Embodiments 7-12. That is, the chewing gum of Embodiment 7 was manufactured using the gum base of Embodiment 1, and the chewing gum of Embodiment 12 was manufactured using the gum base of Embodiment 6.

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Reference Examples 3-4

A conventional chewing gum was manufactured in the same manner as Embodiments 7-12, except that a conventional gum base manufactured in accordance with the method of Reference Examples 1-2 was used. Additionally, the gum base of Reference Example 1 corresponds to the chewing gum of Reference Example 3, and the gum base of Reference Example 2 corresponds to the chewing gum of Reference Example 4.

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Test Examples

A tack reduction test was conducted by means of organoleptic evaluations and a physical property test, using the chewing gums manufactured in Embodiments 7-12 and Reference Examples 3-4.

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Organoleptic Evaluation

A panel of ten persons with false teeth among the molars (ie, dentures and crowns) were allowed to chew 3.2 g of the chewing gums of Embodiments 7-12 and Reference Examples 3-4, and the degree of adhesion of the chewing gum to the false teeth was evaluated by comparison. The evaluation scale started at 0 for the level at which the chewing gum was not perceived as adhering to the false teeth at all, followed by Evaluation Points 1-5 indicating an increasing tendency of the chewing gum to adhere to the false teeth. Finally, the evaluation points of the entire panel were averaged. The results are presented in Table 3.

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Table 3

Embod-iment 7	Embod-iment 8	Embod-iment 9	Embod-iment 10	Reference Example 3	Embod-iment 11	Embod-iment 12	Ref. Example 4
3.8	3.5	3.0	1.5	4.5	0.5	0	1.0

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Organoleptic evaluations, which included flavor and mouthfeel, were conducted by the same entire panel, and the results were that the evaluations of the chewing gums of Embodiments 7-10 and Embodiments 11-12 were ranked the same as that of the chewing gums of Reference Example 3 and Preference Example 4 respectively. Other properties were not compromised, while the tack was reduced.

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Physical Property Test

Spent chewing gum wads obtained by the expert panel chewing 3.2 g pieces of the chewing gums of the embodiments and reference examples at a given rate of mastication were used as the samples, and the adhesion to a false tooth construction material and the adhesion to a flooring material were measured with a rheometer. The test of the adhesion to a false tooth material was conducted by using a methacrylate bed resin adapter, and the test of measuring the adhesion to a flooring material was conducted using a ceramic tile adapter, at an applied pressure of 9 kg and a sample platform speed of 270 mm/min. The results, presented in Table 4, showed that the inventive chewing gum had an extremely low degree of tack in comparison with conventional products.

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Table 4

	Embodiment 7	Embodiment 8	Embodiment 9	Embodiment 10	Reference Example 3	Embodiment 11	Embodiment 12	Reference Example 4
false tooth raw material adhesion	33800 (61)	49100 (89)	27000 (49)	8300 (15)	55200 (100)	2700 (5)	1100 (2)	4900 (9)
flooring material adhesion	40000 (49)	67900 (83)	28700 (35)	14800 (18)	82000 (100)	2500 (3)	1000> (1>)	6600 (8)

Upper number: Adhesion (unit: erg); lower number: The value in parentheses is a relative value with the value of Reference Example 3 set at 100.

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Effects of the Invention

The inventive chewing gum involving the use of a gum base containing an ethylene-propylene copolymer has low tack and a flavor and mouthfeel virtually identical to those of conventional products, thereby preventing the chewing gum from adhering to teeth, false teeth, dental filling materials, floors and roadways.

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Further, ethylene-propylene copolymers are purely chemical synthetic products, and this remedies the problem of concerns arising from the use of raw materials derived from petroleum.